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STATE OF ALASKA

William A. Egan, Governor

ANNUAL REPORT OF PROGRESS, 1969 - 1970

FEDERAL AID IN FISH RESTORATION PROJECT F-9-2

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

Wallace H. Noerenberg, Commissioner

DIVISION OF SPORT FISH

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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska, Federal Aid In Fish Restoration, Project F-9-2, "Sport Fish Investigations of Alaska".

The studies reported herein are investigations evaluating the sport fish resources of the state. Recreational and other impacts on the fishery resources necessitates a continuous endeavor of ascertaining facts and knowledge of the fisheries. The 24 jobs reported on are of a continuing nature. The investigations are composed of 11 projects involved with the inventory and cataloging of the sport fish waters of the state, sport fishery creel censuses, and access. Fish species that received special investigational effort include: Dolly Varden, anadromous fish, grayling, sheefish, whitefish, pike, char, and salmon. The information gathered from the combined studies provides necessary background data for a better understanding of management problems and constitutes a basis for necessary future investigations.

The subject matter contained in these reports is incomplete, and the findings and interpretations subject to re-evaluation as work progresses.

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-2 *Name:* Sport Fish Investigations of Alaska.

Job No.: 17-B *Title:* **Sheefish and Pike Investigations of the Upper Yukon and Kuskokwim Drainages with Emphasis on Minto Flats Drainages.**

Period Covered: July 1, 1969 to June 30, 1970.

ABSTRACT

Tagging data results in the lower Yukon and Koyukuk rivers indicate the presence of a single sheefish, Stenodus leucicthys nelma, population which spawns in the upper Koyukuk River and overwinters in the delta regions of the Yukon River. Analysis of Holitna River data indicates that the Holitna River is a major feeding and spawning area of Kuskokwim River sheefish.

Since 1966, 769 fish have been tagged on the Kobuk River spawning grounds; 291 were recaptured. Of the 1,301 sheefish tagged in Selawik, 121 have been recovered. Sheefish tagged on the Kobuk spawning grounds have been recovered in Hotham Inlet and Selawik Lake. Fish tagged in the Selawik Lake area were recaptured in the Selawik area and the Kobuk River, but not in Hotham Inlet.

Spawning observations were conducted on the upper Koyukuk River and Alatna River locations. An aerial survey was utilized to enumerate the spawning population.

In February, 1970, 50,000 sheefish fry were planted in a rearing pond constructed at Clear. Sheefish fry stocked in Four Mile Lake in 1968 exhibited rapid growth. Growth and survival of fry stocked in this lake in 1969 was poor. Parasites found in Selawik Lake sheefish included two genera of cestodes, a nematode and one specimen of Acanthocephala.

During the nine-week Minto Flats pike creel census, 336 anglers were contacted. Angler success was high, with a catch of 1.4 fish per hour. Estimated fishing hours recorded were 3,198. Anglers harvested 75 trophy-sized pike in the Flats, mainly in the Rock Island Slough area. Preliminary analysis of pike tagging data indicated little summer movement of Minto Flats pike.

RECOMMENDATIONS

1. Continue the experimental lake and river stocking program.
2. Survey the Imruk Basin, Seward Peninsula, to assess its suitability for transplanting sheefish.
3. Study sheefish streams in the upper Yukon River. The Kandik, Porcupine, and Ray rivers are of prime importance since the development of the oil resources.
4. Initiate sheefish spawning studies on the Holitna River in 1970.

5. Continue to collect harvest data, and information on sheefish movements, food habits, and parasites.

6. Initiate a study of whitefish in Interior Alaska.

OBJECTIVES

1. To continue the sheefish tagging program.

2. To make observations of sheefish spawning areas, dates, and spawning behavior in the Koyukuk-Alatna drainage. To enumerate the spawning population and to determine other spawning areas of the Minto Flats population.

3. To continue and expand the egg take and to construct sheefish rearing facilities accommodating sheefish fry to fingerling size.

4. To initiate an experimental lake stocking program.

5. To collect information on angler utilization of sheefish and pike in the study area.

6. To collect additional life history information on sheefish and pike in conjunction with the above objectives.

TECHNIQUES USED

Study areas during the 1969 field season included the Minto Flats area, Selawik, and the Holitna and Koyukuk rivers.

Sheefish used in the migration study were captured by set gill nets of 2 1/2" - 3" bar mesh, beach seine, and hook and line. A drift gill net was used successfully in the Selawik area tagging operation. Yellow and white spaghetti tags were used in the tag and recovery program. Tag recoveries were made by Fish and Game personnel and subsistence fishermen. A $1 reward was paid by the Commercial Fisheries Division to subsistence fishermen. Sheefish aerial surveys of the Koyukuk River were made in a Cessna 180 aircraft.

Pike were collected by hook and line and gill nets of 1/2", 2 1/2", and 3" bar mesh. Jaw tags, Petersen disc, and dart tags were used in the pike tagging program. The Minto Flats was divided into two areas for the pike creel census program. Area I encompasses the lower Tolovana and Chatanika rivers and the mouth of Goldstream Creek. Area II includes the Minto lakes and the Cache area of Goldstream Creek. Fisherman access to Area I is usually by riverboat from the Tanana River; access to Area II is usually by float plane from Fairbanks. An attempt to contact all fishermen in Area I was made. The distance and area involved in Area II made it impossible to census during the entire period. Weekday fishermen in Area II were contacted only during 10% of the nine-week creel census period. The census was also conducted on six weekend days; approximately 75% of the Area II fishermen were contacted. Boat and angler counts were flown at random hours for correlation with ground survey counts.

Separate computations in creel census analysis were made for each area, for weekdays and weekends, and for boat fishermen and plane fishermen. In addition to catch and effort information, notes were made on the number of trophy-sized pike taken and whether the angler was a tourist, military, or local resident. Data from both areas was expanded to 100% to obtain an estimate of the total catch in the Minto Flats.

FINDINGS

The Kobuk and Selawik drainage sheefish tagging program has been a cooperative venture between the divisions of Commercial Fisheries and Sport Fish. This project was partly financed with Anadromous Fish

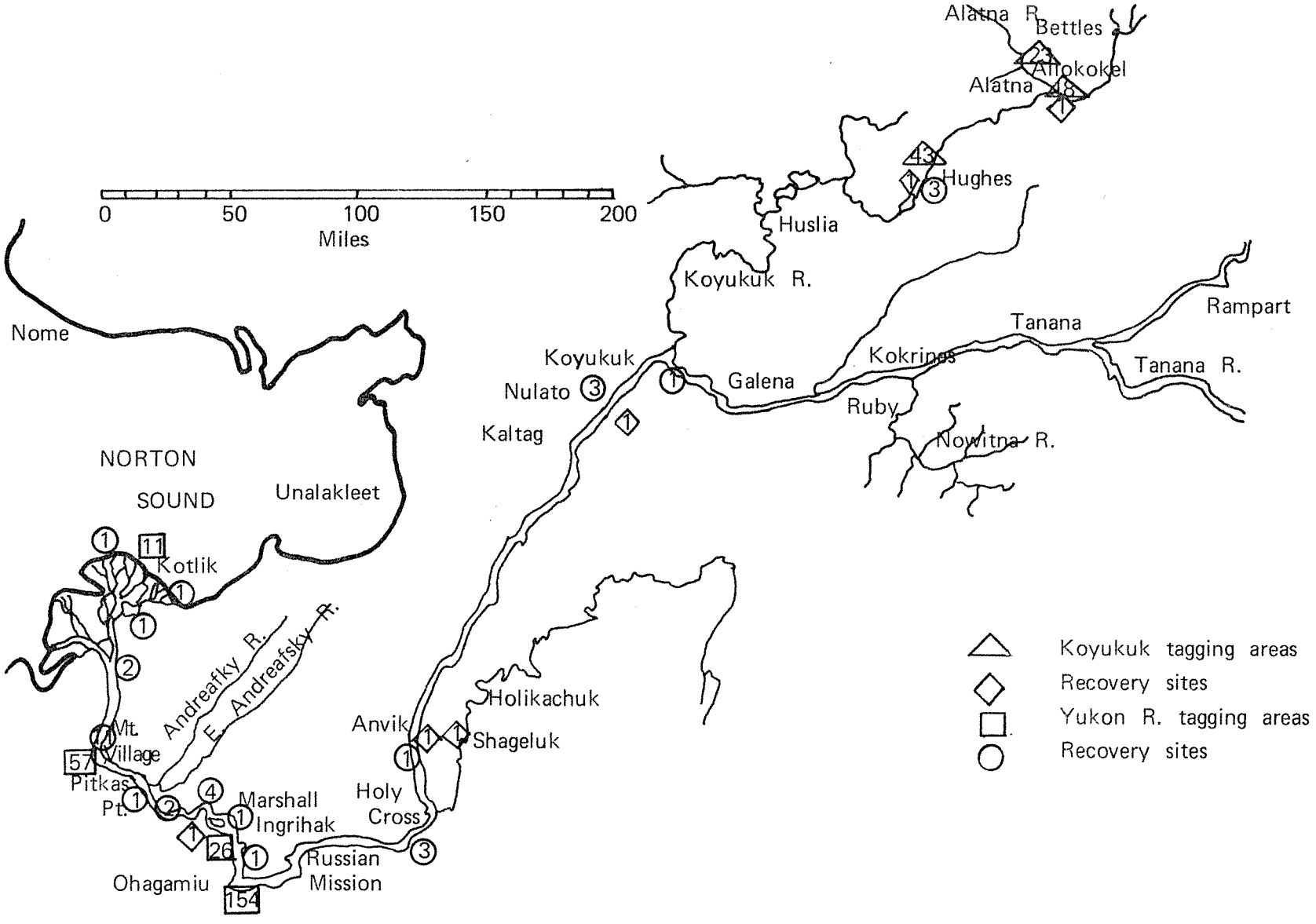

FIGURE 1 LOWER YUKON AND KOYUKUK RIVERS TAGGING DATA, 1961-1969.

Act (P.L. 89-304) funds through the Bureau of Commercial Fisheries. The Selawik-Kobuk tagging data was jointly compiled into a report, satisfying the requirements of Dingell-Johnson Job No. 17-B and Anadromous Fish Act (P.L. 89-304) Project AFC-7.

Sheefish Investigations

Lower Yukon-Koyukuk River Tagging Data:

From 1961 to 1968, 249 sheefish were tagged at the mouth of the Yukon River and at points 87, 113, and 185 miles upstream (Figure 1). Thirty-five (14.1%) of the total sheefish tagged were recovered, the majority in the same year as tagged. Three years was the longest tag-to-recovery period.

The upstream migration rate in the Yukon River, determined from fish recovered 24 - 50 days subsequent to tagging the same summer, averaged 8.6 miles per day. Three fish recaptured at Hughes on the Koyukuk River had travelled 647 - 760 miles from the tagging site.

The lower Yukon River sheefish apparently overwinter in the delta of the Yukon River and ascend the Koyukuk River to spawn near Hughes and in the Alatna River in late September. The longest sheefish migration recorded in Alaska was 1,001 miles. The fish was tagged on the spawning grounds 55 miles up the Alatna River in 1968 and was recovered at the mouth of the Yukon River in December, 1969.

Of the 98 sheefish tagged in the Koyukuk River from 1967 to 1969, six were recaptured. Two were recovered on the spawning grounds at Hughes, one was recovered in the Innoko River (tributary to the lower Yukon River), and the remaining fish were taken in the lower Yukon River. Figure 1 indicates that the Koyukuk and lower Yukon sheefish data may be combined as it appears the fish constitute a single population. It is not known if the sheefish taken at Shageluk would have spawned in the Innoko River, or if it was on a feeding migration.

None of the fish tagged in the lower Yukon River or the upper Koyukuk River were recovered in the Yukon River more than a few miles above the village of Koyukuk. If the lower Yukon River sheefish do not enter this upper section of the river, it is probable that the sheefish in the Melozitna, Nowitna, and Tozitna rivers belong to another population.

Kuskokwim-Holitna River Tagging Data:

In 1969, 47 sheefish were tagged in the Holitna River. Fourteen Holitna River fish tagged in 1967 and 1968 were recovered in 1969. To date, 338 sheefish have been tagged on the Holitna and Kuskokwim rivers of which approximately 10% have been recovered. Major recovery areas have been the Napakiak, Oscarville, and Akiachuk areas from October through December; in the Kwethluk and Bethel areas in March and April; and in the Sleetmute area in June and July.

Analysis of tag return data from the Kuskokwim system indicates that fish tagged at the Holitna River summer feeding areas spend the winter in the delta of the Kuskokwim River. Stomach analysis of many sheefish taken in the lower Kuskokwim River by subsistence fishermen reveals a consumption of tomcod. This indicates some winter feeding in brackish or salt water.

Kobuk-Selawik Tagging Data:

In 1969, 119 tags were recovered from the 279 sheefish tagged during the year in the Kobuk River. From 1966 to 1969, 769 sheefish were tagged in the vicinity of the Kobuk River spawning grounds. On

February 1, 1970, 291 (37.8%) of the 769 fish had been recaptured. Table 1 summarizes the combined Kobuk River tagging data for the four years; Figure 2 shows the location of the tagging and recovery areas.

TABLE 1 Sheefish Tag-Recovery Summary, Kobuk River, 1966-1969.

Tagged		Recovered				
Year	Number	Year	Number	Percent	Cumulative Percent	Percent Remaining
1966	40	1966	4	10.0	10.0	90.0
		1967	7	17.5	27.5	72.5
		1968	4	10.0	37.5	62.5
		1969	0	0.0	37.5	62.5
1967	116	1967	19	16.4	16.4	83.6
		1968	20	17.2	33.6	66.4
		1969	7	6.0	39.6	60.4
1968	334	1968	95	28.4	28.4	71.6
		1969	16	4.8	33.2	66.8
1969	279	1969	119	42.7	42.7	57.3
Total	769		291	37.8	37.8	62.3

The high recovery rate (42.7%) of 1969 tagged fish was due to extremely heavy fishing pressure on the downstream migrants. The Kobuk River remained ice free later than usual, providing excellent beach seining and gill netting conditions. In the four years of study, approximately the same number of Kobuk River tagged sheefish were recovered in Selawik Lake as in Hotham Inlet. This indicates the Kobuk River post-spawning downstream migrants enter both Selawik Lake and Hotham Inlet.

Each year the largest percentage of recoveries has been made in the short period after tagging and during the post-spawning migration. These recoveries consisted of 232 of the 769 fish tagged. The remainder of the recoveries have been fish migrating upstream the following year or the second year after spawning. To date no fish have been recaptured in the third year subsequent to tagging; however, few fish tagged that year would still be available.

Of the 457 sheefish tagged in Selawik in 1968, 112 have been recovered. Forty-nine (43.8%) of these fish have been recovered in the Kobuk River during 1968 and 1969. Of the 844 fish tagged in Selawik Lake in 1969, five have been recovered in the Selawik area and four in the Kobuk River. Table 2 summarizes this information. The fish recovered in the Kobuk River weighed between 11 and 40 pounds and were probably on the spawning migration. One sheefish tagged on the Kobuk River spawning grounds in 1967 was recaptured and released in Inland Lake in June, 1968, then recaptured at Shungnak in 1969.

Recoveries of Selawik-tagged fish indicate that a large portion of fish wintering in the Selawik Lake area spawn in the Kobuk River. To date, none of the 1,301 sheefish tagged in the Selawik area have been recovered in Hotham Inlet. It is not known whether the fish in Hotham Inlet and Selawik Lake intermix or only share a common spawning ground. In 1968, 1,400 sheefish were counted on the spawning grounds 120 - 150 miles upstream on the Selawik River.

Consecutive Annual Spawning:

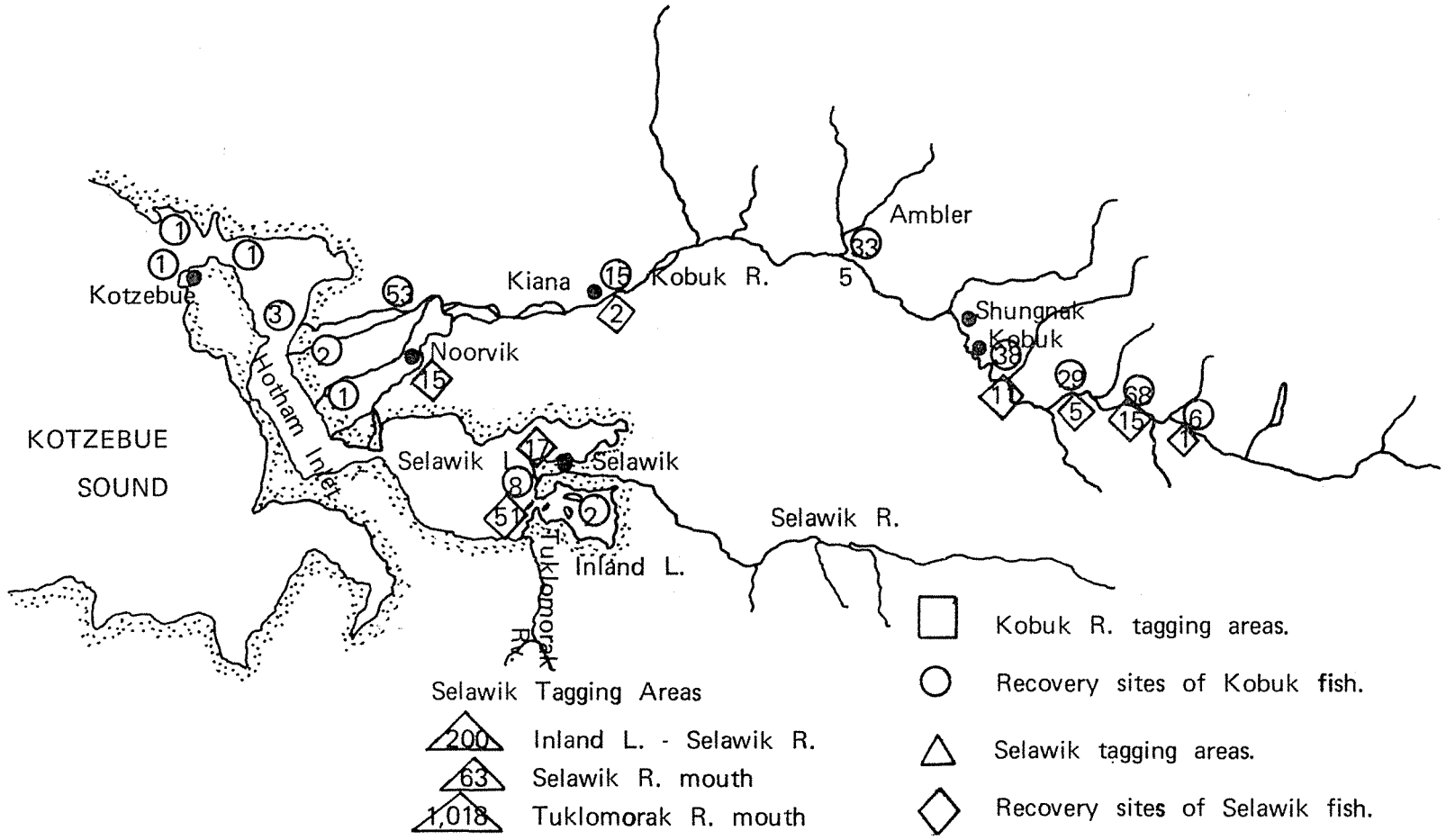

FIGURE 2 KOTZEBUE SOUND SHEEFISH TAG AND RECOVERY DATA, 1966-1969. TAKEN FROM ALASKA MAP B.

Of the possible 282 tagged fish remaining in the Kobuk River population, 27 (9.6%) were recovered migrating upstream or downstream in the Kobuk River the following years. Eight of 104 possible remaining tagged fish (7.7%) were recovered in the Kobuk River the second year after tagging. Past experience on the Kobuk River has shown that 100% of the fish in the upper river spawn. This data indicates that sheefish are capable of spawning consecutively. However, there are fish which do not spawn every year. Mature fish, mainly females, with undeveloped gonads were found on both the Kobuk River spawning grounds and the Tuklomarak tagging areas.

TABLE 2 Sheefish Tag-Recovery Summary, Selawik Area, 1968-1969.

Tagged		Recovered				
Year	Number	Year	Number	Percent	Cumulative Percent	Percent Remaining
1968	457	1968	39	8.5	8.5	91.5
		1969	73	16.0	24.5	75.5
1969	844	1969	9	1.1	1.1	98.9
Total	1,301		121	9.3	9.3	90.7

Koyukuk River Spawning:

Sheefish were observed spawning in the upper Koyukuk River on September 27, 1969. Water temperature was 3°C (37°F). Spawning activity increased and reached a peak the evenings of September 29 and 30. Many of the fish collected for the egg take on October 1 had already spawned. Spawning grounds in the vicinity of Hughes are shown in Figure 3 in the 1967-68 report (Alt, 1968). The Alatna River spawning grounds are located in the vicinity of Siruk Creek, 55 miles up the Alatna River.

An aerial survey of the Koyukuk and Alatna rivers spawning grounds was flown on September 28 with a Cessna 180 aircraft. Weather conditions were favorable; however, because of inexperience in making aerial surveys, the type of aircraft used, and the great depth of many pools, the reliability of the counts was low. In deep pools near Hughes and three miles upriver where good catches were being made with gill net and hook and line, no sheefish could be observed from the air.

Sheefish enumerated in the aerial survey were located in two distinct areas. Nine hundred five sheefish were counted from three miles downstream to nine miles upstream from Hughes. These fish were near the various spawning bars. A few small groups of sheefish were observed in the next 50 miles upstream. These fish were possibly downstream migrants. Sheefish were again encountered in the area below Allakaket and at the mouth of the Alatna River. Large concentrations were present in the vicinity of the Siruk Creek spawning grounds, 50 - 60 miles up the Alatna River. Approximately 1,710 sheefish were enumerated in the area from below Allakaket to 60 miles up the Alatna River. It is probable that the 2,615 fish enumerated represent only a fraction of the total spawning population.

Minto Flats Spawning Grounds:

An aerial survey was made on the Tolovana River in an effort to determine if suitable sheefish spawning grounds were available. From the number of logjams across the river and the shallow conditions of the water in the gravel areas, it is improbable that sheefish spawn in the Tolovana River. The lower ten miles of the

Chatanika River which has a gravel bottom was surveyed by boat; no suitable spawning areas were located.

Sheefish Egg Take:

An experimental sheefish egg take was conducted at Hughes in the Koyukuk River on September 30 and October 1. Sheefish were captured by hook and line, beach seine, and gill net, and kept alive on stringers until October 1. Nine males and four females were used in the egg take. A small number had partially spawned and some of the eggs from one female had turned white.

The eggs, numbering approximately 200,000, reached the Fire Lake Hatchery on October 1. High mortality was noted soon after the eggs reached the hatchery. A possible reason for this mortality is that some of the fish were kept on stringers for one to two nights prior to the egg take and many of the eggs were no longer viable. The eggs began hatching on January 21 with the majority of hatching being completed by February 16. On February 10, 22,000 fry were placed in a rearing pond at Clear Air Force Base. These fish were in excellent condition when compared with the fry stocked in 1969. The remaining 28,000 fry were taken to the Clear rearing pond on February 20.

The Clear rearing pond was constructed by site personnel and the Fairbanks Sport Fish Division staff. The 40' x 220' pond was covered with four inches of fly ash and a thin layer of bentonite to create a seal. Water from the Clear heating plant was piped into the pond. Water temperature of the pond at the time of stocking was 45°F. The pond was artificially fertilized to promote plankton growth and hatchery food was provided.

The fry stocked in Four Mile Lake in June, 1968, exhibited rapid growth. Four nights of net fishing in late May, 1969, yielded nine sheefish averaging 24 cm in length. Three nights of net fishing in August took 13 sheefish averaging 30 cm in length. The fish had been feeding heavily on shrimp and aquatic insects. Forty hours of effort using various sport fishing methods failed to take any sheefish in September.

Parasites:

Two sheefish from Selawik Lake were examined for parasites by Larry Shultz of the Arctic Health Research Center, College, Alaska. Parasites identified were as follows:

Cestodes:	Proteocephalus sp.--abundant, both mature and immature species.
	Cyanthocephalus truncatus--three specimens found.
Nematodes:	Cucullanus sp.
Acanthocephala:	Neoechinorhyncus rutile--one specimen; common in Alaska fish.

Pike Investigations

Three hundred thirty-six anglers were contacted during the ten-week creel census of the Minto Flats. Most of these contacts were made in Area I.

A summary of the completed angler interviews is presented in Table 3. The data was then expanded to 100% to obtain an estimate of the total catch and fishing effort for the Minto Flats as shown in Table 4.

Boat fishermen were more successful and also had longer fishing periods than experienced by fishermen using aircraft (Table 4). Boat fishermen in Area I retained 3.2 pike per fishing trip and 0.24 fish over 36"

in length per trip. Pike in the area of the Cache and in Minto lakes (Area II) were smaller than Area I fish, and no trophy-sized pike were recorded.

A breakdown of Minto Flats anglers shows 49.6% local, 36.8% military, and 13.6% tourist fishermen.

Anglers retained only 22% of the pike caught; therefore, a potential for a large loss due to hooking mortality exists. Most dead pike observed had been hooked in the gills. An educational program urging fishermen to retain pike hooked in the gills and to use single hooks instead of treble hooks would reduce this loss.

Six percent of the pike retained by anglers were trophy size, with a new state record of 27 pounds caught in Rock Island Slough.

In addition to the pike harvest, 40 sheefish were recorded in the creel census program.

TABLE 3 Minto Flats Creel Census Data Based on 336 Angler Interviews, June 1 to August 10, 1969.

	June	July	August	Total
No. anglers checked	95 (28.3%)	205 (61.0%)	36 (10.7%)	336
No. pike caught	1,244	2,483	307	4,034
Total hours fished	926	1,459	408	2,793
No. fish retained	365	666	112	1,143
% retained	29.3	26.8	36.5	28.3
No. fish released	879	1,822	195	2,896
No. fish over 15 lbs. & 36"	30	24	11	65
% fish over 15 lbs. & 36"	2.4	1.0	3.6	1.6
Avg. no. fish/angler	13.1	12.1	8.5	12.0
Avg. no. fish/hour	1.3	1.7	0.8	1.4
Angler hours/trip	9.6	7.1	11.3	9.3
% Released	70.7	73.0	63.5	71.7
Avg. no. fish retained/angler	3.8	3.2	3.1	3.4

Tagging Data:

In 1969, 606 northern pike were tagged using Petersen disc yellow dart and jaw tags. Twenty-three of these were recaptured that summer. Of the 1,034 pike tagged between 1967 and 1969, 41 have been recovered. Since there is no winter fishery on Minto Flats pike, no information was obtained on wintering areas of these fish. Preliminary analysis of tag-return data indicates very little summer movement of pike, with most recoveries being made in the same area. Eleven pike recaptured one year after tagging were taken

in proximity to the tagging area. Assuming that Minto Flats pike migrate downstream in the fall, this would indicate that pike frequent the same areas year after year.

TABLE 4 Calculated Fishing Effort and Catch by Area, Minto Flats, Alaska, 1969.

	No. of Anglers	Hours Fished	Fish Caught	Fish Retained	Fish Over 36"
AREA I:					
Planes - Weekdays	20	47	126	42	3
Planes - Weekends	11	51	34	7	---
Boats - Weekdays	63	564	693	199	15
Boats - Weekends	214	1,983	2,076	706	57
AREA II:					
Planes - Weekdays	32	128	1,020	120	---
Planes - Weekends	90	425	2,250	285	---
Total Estimate	430	3,198	6,199	1,359	75

LITERATURE CITED

Alt, Kenneth T. 1968. Sheefish and Pike Investigations of the Upper Yukon and Kuskokwim Drainages with Emphasis on Minto Flats Drainages. Alaska Department of Fish and Game. Federal Aid In Fish Restoration, Annual Report of Progress, 1967-1968, Project F-9-1, 9:307-322.

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